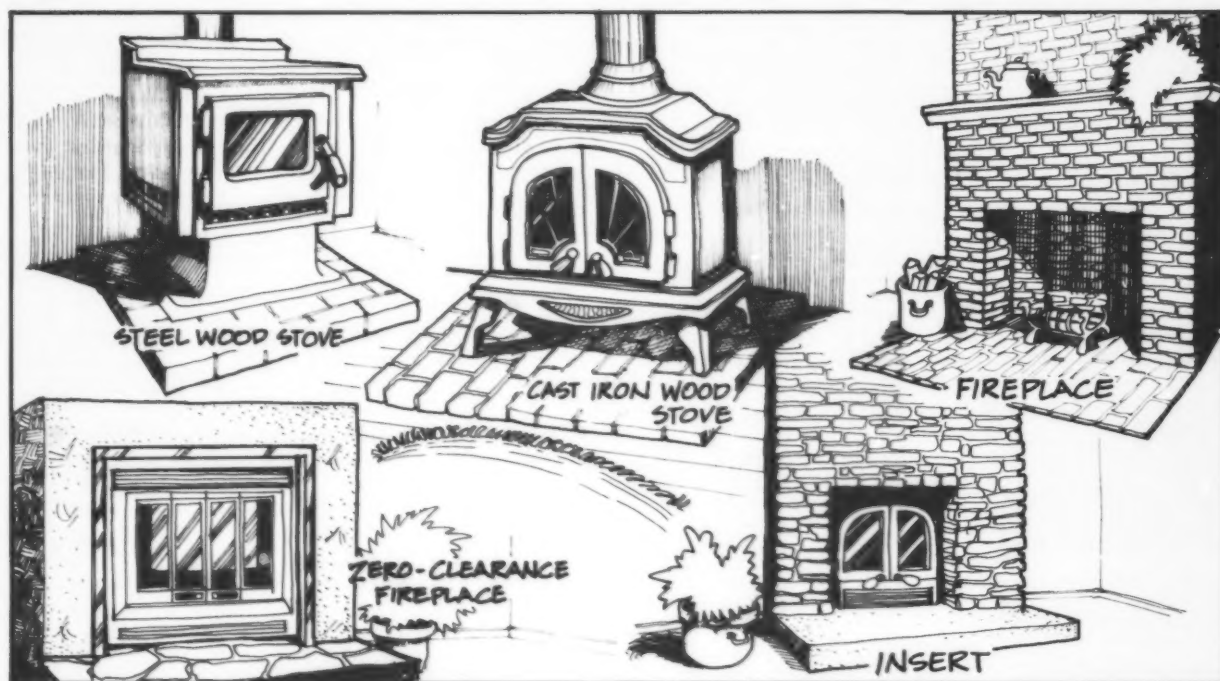


Wood Heating



Introduction

A fireplace or stove can be both fun and useful. A fire is pleasant to watch and can provide all or some of the heat for your home.

If you are considering wood heating, think your decision through carefully and plan ahead. This booklet will help with information about cost and convenience, choice in fireplaces and stoves, and their sizing, installation, operation and maintenance. It also examines some of the differences between heating with wood or coal. It does not cover wood or coal furnaces, furnace

add-ons or boilers. For more information on these appliances, call the toll-free Energy Matters line (dial zero and ask the operator for Zenith 22339 or call 427-5300 in Edmonton).

You should read the information before shopping for a fireplace or stove. Details about installation, operation and maintenance affect where you install it and may change your mind about the fireplace or stove you buy.

Why Do you Want to Burn Wood?

Is it for pleasure or heating? If you are more interested in enjoying the sight and sound of a fire, choose wood over coal. Coal glows when it burns but wood gives a bright, crackling fire. The choice in appliances will also be more limited if you use coal. It burns hotter than wood and needs a specially designed stove.

You can burn wood in a stove or fireplace. When we refer to stoves here, we mean airtight, free-standing units that allow a controlled rate of burn. Fireplaces are not as airtight and their rate of burn cannot be controlled easily, if at all.

For pleasure, fireplaces have some advantages. They generally give a better view of the fire and are easier to operate. A well-designed, factory-built fireplace, or one of the improved masonry designs, is a better choice than a conventional open fireplace. They are more efficient and less drafty. (There are tips for improving conventional fireplaces on page 8.)

A well-designed fireplace will contribute heat to your home, but is primarily for enjoyment. Do not rely on a fireplace as your main heat source.

If you want to use wood to heat your home, look for an efficient and properly sized stove. Stoves can be attractive and most now have glass doors so that you can see the fire. But stoves designed for space heating are not pleasure units and require careful operation. Although not discussed here, coal or wood furnaces and boilers are space-heating options.

Does Wood Heating Make Sense for You?

Before you decide to heat with wood, consider convenience and cost.

You will take on new responsibilities. Keeping your house warm will not be as easy as turning up the thermostat. You can expect a number of chores.

- Refuel the unit every few hours. If you are away for long periods of time, coal may be more convenient than wood. Coal sustains a fire longer -- about twice as long as aspen, for example.

- Check the stovepipe and chimney monthly for creosote (a smoke residue that can cause dangerous chimney fires) and clean yearly to prevent chimney fires.
- Clean out the ashes.
- Check the unit and chimney annually for signs of wear and corrosion.
- Store wood properly, and cut, split and haul it if you harvest your own trees.

These tasks can be enjoyable, but do require attention and time. Be sure they fit into your schedule before you decide to heat with wood.

In Alberta, you need a cheap, secure supply of wood or coal to keep costs competitive with natural gas. Table 1 compares the cost of heating with purchased wood, wood harvested by the user, coal, natural gas, and propane. The costs presented are rough and will vary around the province. Use the list of expenses to develop a more accurate comparison for your area.

Using Table 1, you can calculate "paybacks", or how quickly one fuel pays for itself in savings compared to another fuel. A payback period is the difference in set-up costs between any two fuel types divided by the difference in annual operating costs.

$$\text{Payback} = \frac{\text{difference in set-up costs}}{\text{difference in operating costs/year}}$$

The shorter the payback period, the better the investment.

If each stove or fireplace in Table 1 contributes 100 gigajoules (94.8 million BTUs) of space heating every year, the payback periods of wood and coal compared to gas and propane are as follows:

- user-harvested wood pays back in 3.5 to five years compared to gas, 1.5 to two years compared to propane
- purchased wood does not pay back against gas, but pays back in four to seven years compared to propane
- coal pays back in 17 to 20 years compared to gas, three years compared to propane

If you have to bring in natural gas to an unserved lot, the hook-up fee will make coal and wood more competitive with gas.

Table 1
Heating Cost Comparisons (1988 prices)

	User-harvested Wood	Purchased Wood	Coal	Natural Gas	Propane
Set-Up Costs					
Chainsaw	\$450-500				
Splitting Maul	\$20	\$20			
Appliance	\$800-1200	\$800-1200	\$1300-1400	\$450-500	\$450-500
Chimney	\$400-450	\$400-450	\$400-450		
Cleaning Equip.	\$65				
Storage			\$100		
Other				Hook-up fee unserviced lot	
Operating Costs/Yr					
Fuel costs *	\$0	\$4.80/GJ (aspen)	\$1.78/GJ	\$2.53/GJ	\$6.40/GJ
Maintenance	\$0	\$100	\$100	Negligible	Negligible
Other				\$100 fixed service fee	\$120 storage tank rental

* 1 /GJ = 948 000 BTUs

Assumptions

1. The calculations assume that all heaters are about the same efficiency (60 per cent) and size (40 megajoules per hour output or 38000 BTUs per hour). This means that the gas and propane units are direct-vented space heaters rather than furnaces.
2. The cost of chimneys for wood and coal heaters assumes they are installed on the main floor.
3. The table assumes that users who harvest their own wood also clean their own system and that the purchased wood or coal systems are professionally cleaned twice a year.

Choices in Stoves and Fireplaces

This section describes the most common design options for stoves and fireplaces and how these affect safety, durability and efficiency. It begins with some definitions and principles on efficient wood heating.

The overall efficiency of a fireplace or stove is a combination of combustion and heat transfer efficiency.

Combustion efficiency is a measure of how completely a fuel burns. The more completely it burns, the more heat it produces and the higher the combustion efficiency. A fire with nearly perfect combustion produces little ash or smoke and most of the energy in the fuel is converted to heat. To burn completely, wood needs a good mixture of air with hot gases from the fire, high temperatures in the firebox (or a catalyst that allows gases to burn at a lower temperature), and adequate time at high temperatures.

Heat transfer efficiency compares the amount of heat delivered to your house to the amount lost up the chimney. The less heat lost, the higher the heat transfer efficiency. Heat transfer efficiency will increase with an appliance with a large surface area, a firebox uninsulated from

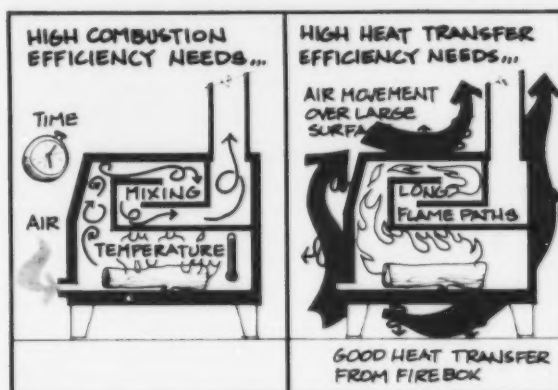


Figure 1 Principles of combustion and heat transfer efficiency

the inside, long flame paths in the firebox (to increase the time available for heat transfer), and good air movement around the unit.

Figure 1 illustrates the principles of combustion and heat transfer. High efficiency appliances have several advantages. Airtight construction uses less air for combustion which means less household air is lost up the chimney. Controlled burning uses less fuel, so you spend less money buying wood and less time preparing it. Finally more complete combustion means a cleaner burn and less maintenance.

When shopping for fireplaces and stoves check that they are certified by the Canadian Standards Association (CSA), the Underwriter Laboratories of Canada (ULC) or Warnock Hersey (WH). The Standards Council of Canada recognizes these organizations as certifying agencies for wood and coal units. Certified fireplaces and stoves are labelled as safe to operate within the guidelines described on the label and in the operator's manual.

The overall efficiency of stoves ranges between 45 and 80 per cent. Fireplaces are generally not as efficient as stoves, averaging between 35 and 60 per cent for well-designed units. Conventional masonry fireplaces are the least efficient at between -10 and 10 per cent.

Wood Stoves

Radiant stoves versus circulating

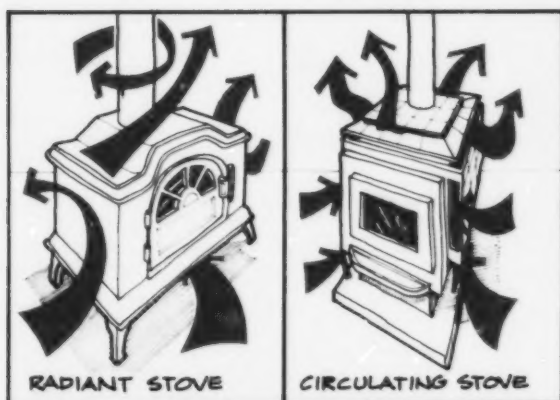


Figure 2 Radiant and circulating wood stoves

Radiant stoves heat objects rather than air (Figure 2). Because air flows around them more, circulating stoves can have higher heat transfer efficiencies than radiant stoves. Circulating stoves by contrast, allow air to circulate between the inner metal firebox and a decorative outer layer of metal, either by natural convection or helped by fans. The air absorbs heat from the stove, then flows throughout the room.

Some people prefer circulated warm air because it heats rooms more evenly. Circulating stoves also have cooler surfaces than radiant stoves, making them safer near small children.

Steel versus cast iron stoves

There are different opinions about the best choice between cast iron and steel. Advocates of cast iron point out that a steel stove warps if it gets too hot. Advocates of steel like its lower price and point out that cast iron can crack. Properly maintained, either can provide years of efficient heating.

Whatever kind of stove you buy, check that the joints are tight. Cast iron stoves are assembled and the joints should be sealed with stove cement or a combination of gaskets and stove cement. The joints on steel stoves are welded.

Stoves are also made of soapstone or tile. If well constructed and properly used, they will also have good durability. Soapstone and tile have higher mass than metal, and so store more heat but warm up more slowly. They generally have better combustion efficiencies because their interior temperatures are higher, however heat transfer efficiencies are lower.

Airtight construction

Being airtight reduces the random entry of air into the firebox. Excess air cools and dilutes gases in the firebox reducing both heat transfer and combustion efficiencies. Airtight stoves control the rate of combustion and heat output, and reduce the amount of household air lost up the chimney. These stoves are safer because you can shut down the air supply on the stove, giving you better control over chimney fires.

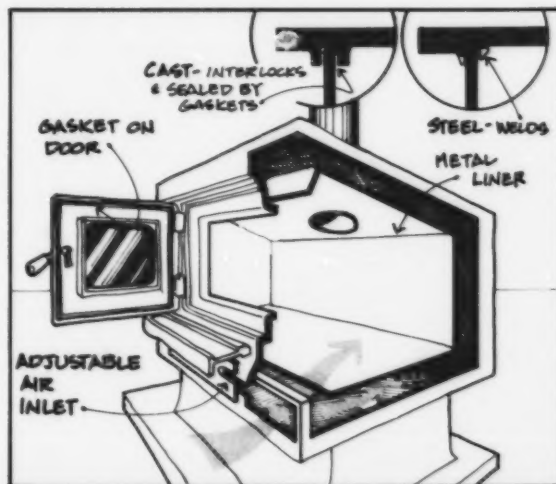


Figure 3 Airtight wood stove

An airtight stove has dampered air inlets and tight-fitting doors with gaskets (Figure 3). To check how airtight the stove is, make sure its doors fit tightly. Close the doors on a piece of paper. If you can pull the paper out easily, the doors are not tight enough. Check the dampers on the air inlets to make sure they also close tightly.

Baffles

Baffles are metal plates between the firebox and the stove flue (Figure 4). They are intended to channel hot gases on a longer route to the chimney. This increases the time available for the gases to burn and transfer heat to the stove's exterior. Baffles also help mix hot gases and air by adding twists to the exit route. The most a baffle will add to efficiency is two to three per cent.

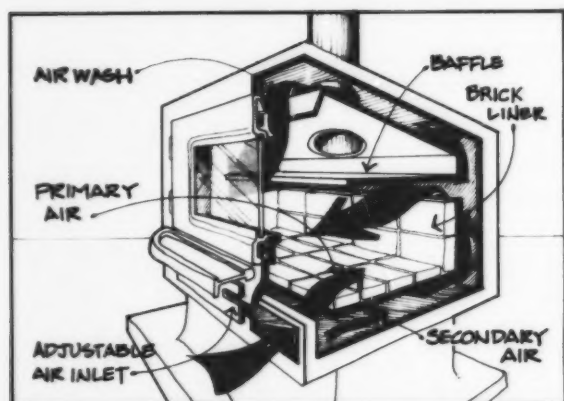


Figure 4 Some wood stove features

Secondary air inlets

A stove always has a primary inlet for air that provides air directly to the fire. A secondary air inlet (Figure 4) introduces more air higher in the flame path where a lack of oxygen often inhibits combustion. Secondary air improves combustion efficiency, but may reduce heat transfer efficiency because it cools gases upstream of the fire. The overall effect of secondary air on stove efficiency is small.

Insulating stove liners

Firebrick is a common insulating liner, while other stoves come with metal liners (Figures 3 & 4). Both keep the temperatures inside the stove higher, which improves combustion efficiency, however, they reduce heat transfer from the interior to the exterior of the stove. There is little effect on overall efficiency, but liners can help protect the firebox from heat-induced deterioration.

Catalytic combustors

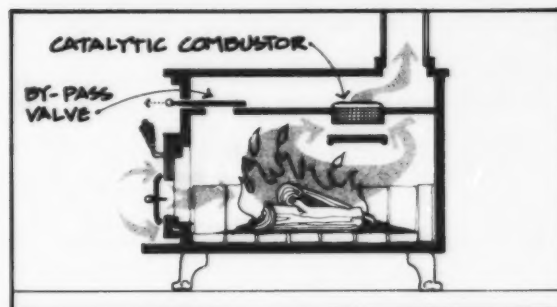


Figure 5 Wood stove with a catalytic combustor

A catalytic combustor (Figure 5) is a specially coated ceramic mesh which is located above the fire at the top of the stove. Combustion gases that pass through it will burn more completely resulting in more heat and less creosote. Catalytic combustors can reduce creosote build-up by as much as 50 per cent and improve overall stove efficiency by as much as 10 per cent. Some stoves have combustors built-in, but you can also buy them as accessories.

The fire must be above a certain minimum temperature before a combustor will work. In stoves that come equipped with combustors there is a manual bypass valve that allows you to send the smoke directly up the chimney until the minimum temperature is reached. Buy a stove-top thermometer so you can monitor the temperature of your fire and follow the operating instructions.

You can damage a combustor with prolonged exposure to hot fires and by burning things other than wood such as coal, newsprint, gift wrap, plastic and synthetic logs.

What is the best combination of features in a wood stove?

The best combination of features depends on how you want to use the stove.

- Do you plan to heat with it? We recommend an airtight design if you intend to heat with wood. It improves the overall efficiency and allows you to control the heat output of the fire. If you burn wood for recreation, choose a simple stove without features that require careful operation such as catalytic combustors. A zero-clearance fireplace, fireplace insert, or one of the improved designs for masonry fireplaces may be a more appropriate choice.

- Do you want to sustain fires over long periods? Do you want the fire to last overnight or through the day while you are at work? If so, you will definitely want an airtight stove that allows a controlled, long, low-output fire. If this is the way you plan to operate the stove most of the time, a catalytic combustor could be useful because low fires are smoky and result in a lot of creosote. You need to be sure, however, that the fire remains hot enough for the combustor to work.
- Do you want to reduce maintenance and the risk of chimney fires? Consider features such as catalytic combustors, secondary air inlets and insulating stove liners. All help control creosote.
- Do you want to be able to burn things other than wood? If you expect to burn paper and cartons occasionally, or other non-wood items, do not get a catalytic combustor. It is easily contaminated and once contaminated, will not work.
- Do you want a stove that requires little monitoring? Some features work well only within a certain operating range. For example, secondary air inlets work best with a brisk fire. Catalytic combustors need a minimum temperature to be activated and can be damaged by frequent or long-burning hot fires. If it is not convenient to adjust the fire while it is burning, avoid these features.
- Do you have small children? You may prefer a circulating to a radiant heater because the exterior surfaces are usually cooler. Insulating liners also reduce the surface temperatures.

Other things to consider when choosing a stove include cost, warranties, and appearance. Determine whether the appliance is easy to use: would you prefer a front-loading, top-loading or side-loading stove? If you plan to install it yourself, how difficult will it be? Check the certification and manufacturer's instructions to make sure the stove can be safely installed where you want it. Check with your insurance company to see if installing a wood stove requires changes to your policy.

Coal Stoves

Coal has two advantages over wood: it is cheaper to buy and sustains a fire longer. A longer burn is useful if you need to keep your unit operating overnight, during the day while you are at work, or over weekends. Coal burns hotter than wood, however, and leaves more ash.

It requires the right equipment and more care. **If you plan to burn any coal, you must get a coal-burning unit. Do not burn coal in a stove not specifically designed for it.**

If you are concerned about the environment, burning coal does release more emissions than wood. However, the sulphur content of Alberta coal is much lower than coal from the east.

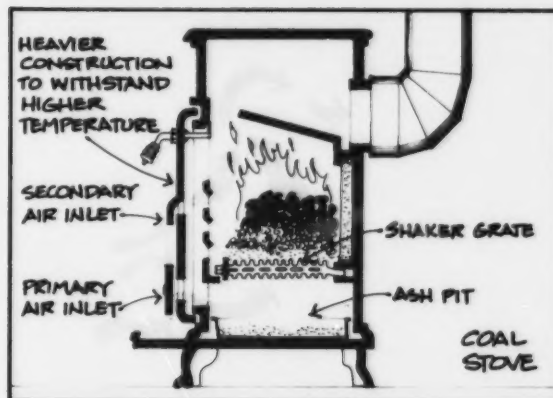


Figure 6 Coal stove

The design options of coal stoves are much the same as those of wood stoves and have similar effects (Figure 6). Being airtight is as useful for coal stoves as for wood because it allows control of the length and intensity of the burn. Some features, however, are more crucial. Coal stoves are usually cast iron because they have to withstand higher temperatures. Coal also leaves a lot more ash, which is why coal stoves have special grates that allow you to shake the ash out of the burning fuel. The grates are set high above the bottom of the firebox to allow for the extra ash accumulation. Coal burns best if the primary air inlets are below the bottom of the grate so that oxygen filters up through the embers.

Barometric draft controls are a useful safety feature on coal stoves. A draft is the upward movement of air through a chimney caused by hot gases rising. It exhausts smoke and draws fresh air into the firebox for burning. If a draft becomes too strong, it can cause a run-away fire that can burn dangerously hot, especially with coal. Barometric draft controls allow room air into the chimney when the draft gets too strong, reducing the flow of air into the fire. **Catalytic combustors cannot be used with coal stoves because the coal contaminates them.**

Follow the instructions on the certification label and in the owner's manual when installing and operating a coal stove.

Fireplaces

Most fireplaces are for pleasure. If well-designed, they can contribute to home heating, but you should think of them as secondary heat sources at most. Rely on other sources, such as a furnace, to keep your house warm.

The conventional masonry fireplace is the least efficient design. Choose a more efficient option such as an improved masonry design, a zero-clearance fireplace or a fireplace insert. These allow the look of a traditional mantle, but avoid the cold drafts and inefficient use of wood of the conventional fireplace.

Improved masonry designs

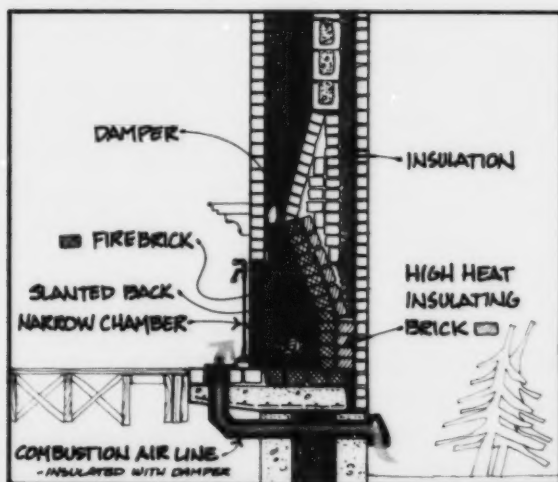


Figure 7 Improved design for a masonry fireplace

If you want an open masonry fireplace, choose a shallow firebox with a slanting back, which can radiate twice as much heat as a conventional square firebox (Figure 7). Good damper systems in the chimney reduce drafts and household air losses. Some designs are more massive than conventional brick fireplaces. This allows them to store a great deal of heat energy that is normally lost. The overall efficiency of some of these fireplaces is as high as 35 to 40 per cent -- a big improvement over the conventional -10 to 10 per cent.

Zero-clearance fireplaces

These may be referred to as factory-built fireplaces and are designed to have cool exterior surfaces. This allows the spacing, or clearances, between them and combustible materials to be reduced. Within proper guidelines, a zero-clearance fireplace can be installed in a wood-framed wall.

Figure 8 shows a typical zero-clearance fireplace. It has a double wall construction with or without fans, that allows air to circulate around the firebox and deliver warm air to a room.

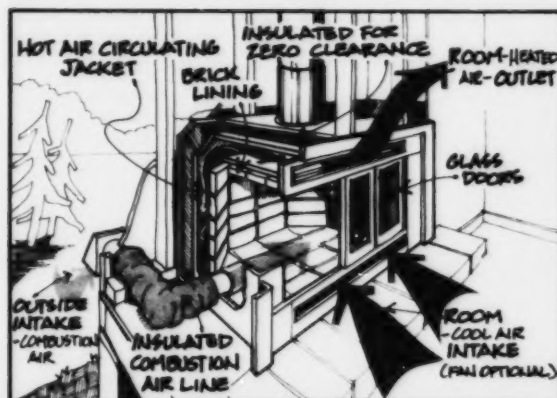


Figure 8 Zero-clearance fireplace

Though glass doors are a common feature, zero-clearance fireplaces are not as airtight or efficient as airtight wood stoves. The doors reduce household air losses, but do not eliminate them. Ceramic glass doors can be more airtight than tempered glass doors because they can withstand higher temperatures. Tempered glass doors are loosely fitted to keep them cool and prevent breakage. To get the most heat, keep the glass doors open when the fire is brisk and close them when it dies down.

Most zero-clearance fireplaces have combustion air inlets for the firebox. The inlets have dampers that can be closed when the fireplace is not lit or to help control the fire.

A good zero-clearance fireplace will have a large heat transfer area around the firebox, good air flow through the vents and reasonably tight glass doors. Check the flue damper for a good tight fit because this will reduce household air losses when the fireplace is not lit.

Fireplace inserts

Inserts are like airtight wood stoves encased in a masonry wall (Figure 9). Generally they are less efficient than wood stoves because they have less surface area exposed for heat transfer. Inserts are usually installed into existing open masonry fireplaces but they can also be built into new masonry.

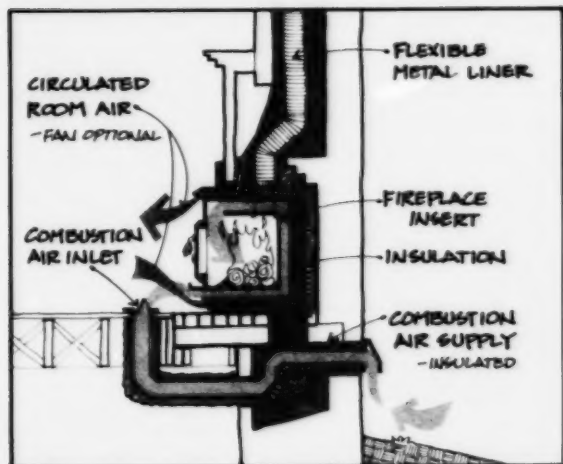


Figure 9 Fireplace insert

Inserts have vents that allow air to circulate around the firebox, sometimes with the assistance of fans. As they are airtight, inserts use little household air and can be adjusted to supply the amount of heat you want. Look for tight-fitting doors and air inlets, a large area around the firebox where air can pick up heat, and good air flow through the vents.

Unlike factory-built fireplaces, inserts are not designed to reduce clearances. **Be sure to respect clearances when you install an insert and never put one into a wood-framed wall.** If your masonry housing for the insert is on an exterior wall, make sure to insulate the back of the appliance to prevent excessive heat loss to the outside.

Improvements to conventional fireplaces

If you have a conventional masonry fireplace that is drafty and cold, there are ways to improve it. The most expensive, but most effective, is to install an insert or a stove. A zero-clearance fireplace can be adapted to an existing fireplace, but installation is more difficult because the unit must be installed with its approved chimney and accessories. An insert can usually sit right inside the existing fire chamber. A stove will always sit in front of the chamber and change the appearance of the

fireplace considerably. Your choice should be a stove if you want to start burning wood for space heating, and an insert if you want a more efficient recreational fireplace.

If you install a stove or an insert, you should also put in a new rigid or flexible stainless steel chimney liner. A new liner will make the unit safer and easier to light. It will also collect less creosote and be more resistant to corrosion (see page 10). It is also a good idea to install an insulated combustion air line to reduce the amount of household air the fire burns, makes your fireplace easier to light, and contributes to its safe operation (see page 11).



Figure 10 Improvements to a conventional masonry fireplace

A less expensive method to improve the efficiency and operation of a conventional masonry fireplace is to bring in combustion air and install glass doors (Figure 10). The combustion air has the same benefits described above and the glass doors will reduce the loss of household air. Doors can be custom-made to fit your fireplace. Remember that ceramic glass doors are more airtight than tempered glass.

Rather than glass doors -- and for less money -- you can install a chimney top damper or build a fireplace plug. A chimney top damper is installed at the top of the chimney and is operated from inside. Closing the damper prevents drafts and household air losses. To build a fireplace plug, frame a box that fits snugly into the opening of the fireplace. Insulate inside the box with batt or rigid insulation, cover the back with drywall, the front with plywood, and weatherstrip it around the edge. The plug seals the mouth of the fireplace when it is not in use and prevents household air from escaping up the chimney. Make sure your fire is completely out before inserting a fireplace plug.

What is the best combination of features in a fireplace?

The best combination of features depends on what you want from a fireplace.

- Do you want to modify your fireplace to heat your home? If so, you should install a stove.
- Do you want improved performance from a recreational fireplace? The least expensive method to improve a conventional masonry fireplace would be to install a combustion air inlet and build a fireplace plug or add a chimney top damper. If you are installing a new fireplace, consider an improved masonry design, a factory-built appliance or an insert for higher efficiency.

Choose a fireplace that suits your tastes and budget. Consider how convenient it will be to use. Before you buy, check the warranties and make sure you can install the fireplace where you want it. See if your plans for a fireplace alter your house insurance policy.

Selecting the Correct Size

If you are serious about using wood as your primary heating fuel buying the correct size of unit is crucial. The right size depends on:

- how big an area you plan to heat. Do you want to heat a single room? Several rooms? The whole house? You need a bigger unit to heat a bigger space. If you intend to heat more than one room, make sure you have a good means of distributing the heat (see page 12).
- the heat loss characteristics of the space. To determine how much heat a space needs, you need to know how quickly it loses heat. A heat loss calculation gives you this information. **Call Energy Matters (dial zero and ask for Zenith 22339 or call 427-5300 in Edmonton)** for more information on how to do a heat loss calculation, or ask your heating contractor or salesman.

Buying an oversized wood heater is a common mistake. As a general rule, it is better to install an undersized appliance than an oversized one. You can back up an undersized appliance with other space heaters. But if you operate an oversized appliance below its design capacity to avoid overheating a space, smoky fires that deposit more creosote will be the result. This means you will spend more time checking and cleaning the unit and chimney.

Installing Your Appliance

This section outlines points about installation that contribute to the safe and efficient operation of fireplaces and stoves, but it is not a comprehensive guide. **Always follow manufacturer's instructions and building code requirements carefully.**

Clearances

Clearances are the safe distances between combustible materials and the unit or chimney. The need to keep some items, such as furniture and paper, clear is obvious, but clearances also apply to the wood framing in your walls, floor and ceiling.

Clearances vary with different appliances and are specified on the label that all approved appliances carry. Typically, they range from half a metre to a little over a metre (20 to 40 inches). The specially designed zero-clearance fireplaces do not need such large spacing, although some spacing is required. Clearances can be reduced with properly installed barriers to protect combustible materials. For example, clearances to a wood-framed wall can be reduced by 50 per cent with a solid brick barrier spaced 2.5 cm (one inch) away from the wall. The barrier must allow air to circulate behind it and be supported away from the wall by non-combustible spacers.

Clearances are specified in the Alberta Building Code. It is important to plan enough room around the unit to respect clearance requirements or to plan ways to reduce them.

Chimneys

Wood and coal burning appliances are now required to have a factory-built 650-degree centigrade (1200-degree fahrenheit) insulated steel chimney specifically approved for this application. This is a fairly recent regulation and older wood-burning units may not be up-to-date and should be inspected. Replace any chimney that is deteriorating. If you are installing an insert or stove into a traditional masonry fireplace, you should put a new stainless steel liner inside the existing tile flue. This will add to your cost, but the chimney will be safer. The chimney will be more resistant to corrosion and the exit temperature of the smoke will be higher, resulting in less creosote and a better draft.

The chimney should be the same size as the flue collar on your unit. If a chimney is too big, the smoke will cool too much to maintain a good draft and will condense as creosote. If too small, the chimney will not be able to exhaust enough smoke to keep the fire burning efficiently. **Follow the manufacturer's installation guidelines carefully.**

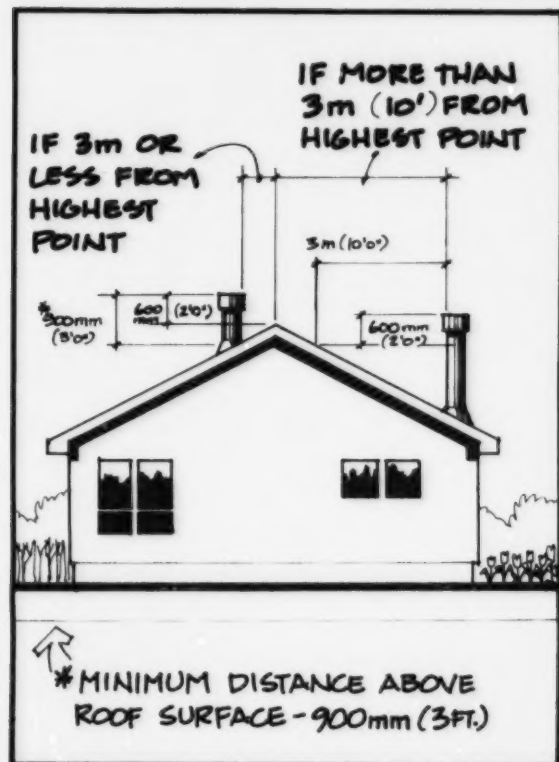


Figure 11 Chimney height

To ensure the chimney is the proper height, follow the guidelines in Figure 11. The distances specified are minimum distances, but it is important not to make the chimney too tall. Smoke can cool too much in a tall chimney, resulting in condensation, creosote build-up, and a poor draft.

Keep the stovepipe that connects your unit and chimney as short and straight as possible. This promotes a good draft and reduces creosote, which collects in bends of stovepipe. You can buy single-walled or double-walled stovepipe. Single-walled allows greater heat transfer to the room improving the overall efficiency of the system. Double-walled pipe inhibits heat transfer, but keeps smoke at a higher temperature, reducing creosote build-up. Double-walled stovepipe also allows smaller

clearances than single-walled. The inner wall is stainless steel so it lasts longer than the standard single steel stovepipe. Keep all stovepipe visible; do not run it through closets or false walls. Stovepipe is not meant to be as durable as the chimney and needs to be checked easily for corrosion.

Install the chimney and stovepipe with ease of inspection and cleaning in mind. A vertical installation is easiest to inspect and clean. If this is not possible, install clean-out hatches in convenient places to allow inspection inside the stovepipe and chimney (Figure 12).

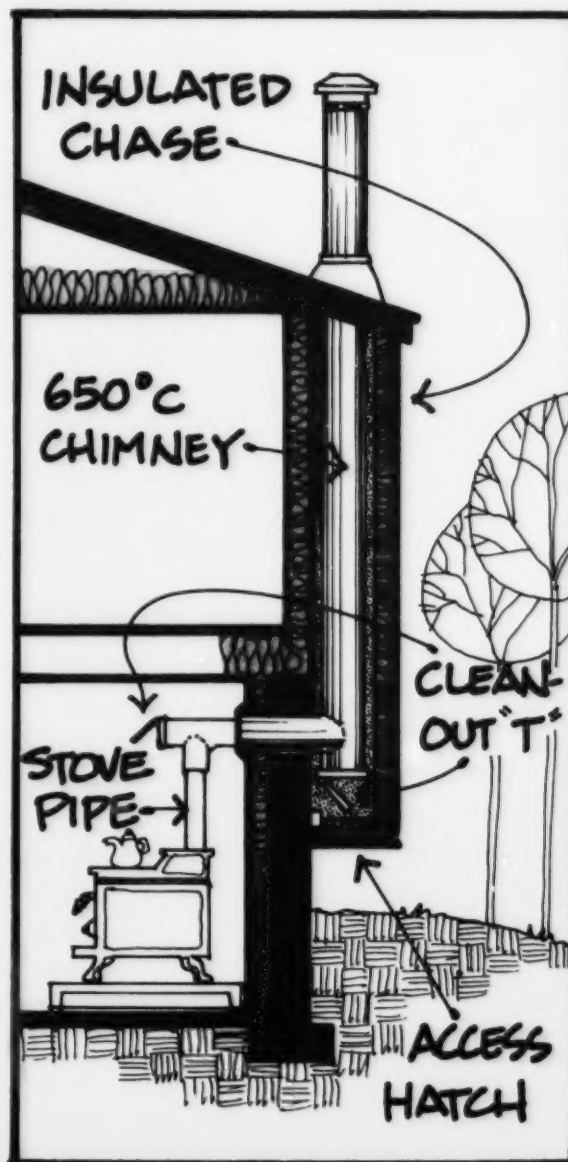


Figure 12 Chimney cross-section

Try to put the chimney on an inside wall. It will keep warmer and a warm chimney has better draft, less corrosion and less creosote build-up. If you have to install the chimney on an outside wall, build an insulated chimney chase around it. Frame around the chimney up the side of the house and be sure to respect clearances. Insulate inside the framing and support the insulation to stop it from slumping against the chimney. Finish the outside of the chase to match the exterior of the house.

Combustion Air

Every fuel-burning unit including stoves, furnaces, heaters and fireplaces should have its own combustion air supply. Otherwise, they can depressurize your home and result in serious backdrafting problems.



Figure 13 Backdrafting

Backdrafting happens when air is sucked down one of the chimneys to replace air exhausted by some other appliance (Figure 13). If this happens to your furnace or wood or coal unit while it is operating, it can spread toxic gases, including carbon monoxide through your home.

Combustion air is especially important in an airtight house which has fewer leaks where replacement air can seep in. It is also extremely important in mobile homes because they are small, relatively tight, enclosed spaces. Wood-burning appliances must be specially approved to be used in mobile homes.

Many zero-clearance fireplaces come with pipes that supply combustion air directly to the firebox from the outside. If you are installing a combustion line for an existing open masonry fireplace, be sure to bring it to the front of the fire chamber. This will keep the inlet from blowing sparks into the room. Sometimes you can adapt an old ash clean-out as a combustion air supply (Figure 10).

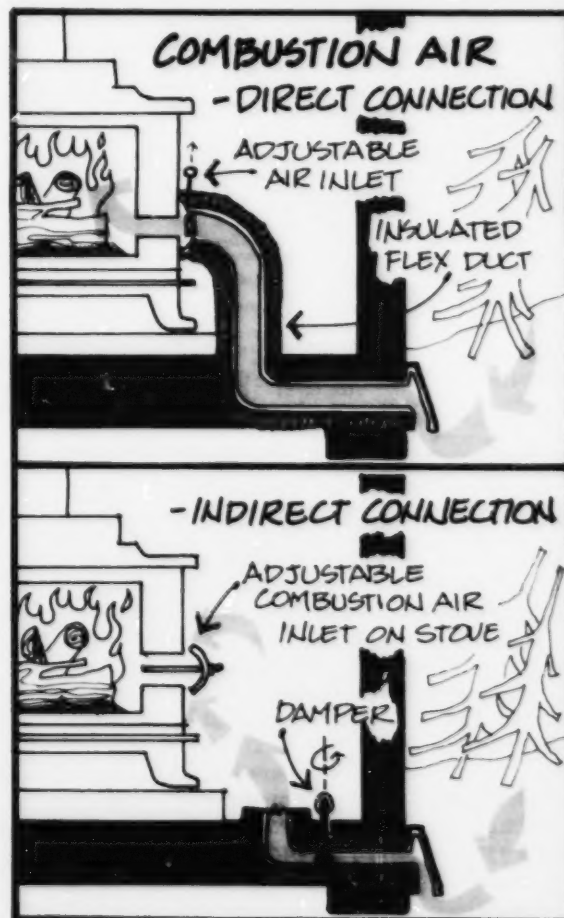


Figure 14 Combustion Air

Kits are available to connect a combustion air line directly to the air inlet control on airtight stoves and inserts. Some stoves are designed to enclose a combustion air line in the housing that sits on the floor below the firebox. You can also install a combustion air line -- to feed near an appliance -- with a damper system that can be opened and closed (Figure 14).

All combustion air lines must be insulated. The diameter of duct increases with the output of the appliance and is specified in the Alberta Building Code. **Call Energy Matters for more information (dial zero and ask for Zenith 22339 or call 427-5300 in Edmonton).**

Heat Distribution

This is especially important for space-heating appliances. You should install the appliance in an area where you spend a lot of time. This is where you need the heat and can tend the fire conveniently.

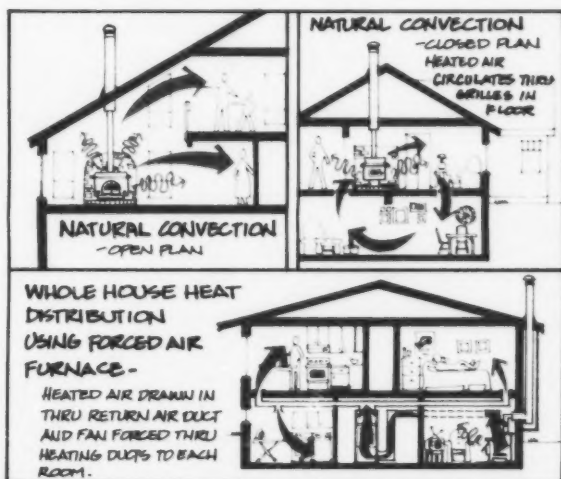


Figure 15 Options for heat distribution from a wood stove

Figure 15 illustrates some heat distribution options. If you want to distribute the heat throughout your home and have a forced-air furnace with a two-speed fan, you can use the furnace fan. This works especially well if the return air ducts are installed high in the room containing the wood heater. The ducts will draw warm air off the ceiling where it collects. Consider a high return air duct if you are renovating or are building a new home that will use wood heating and a back-up forced-air furnace.

You can also distribute heat by installing vents between rooms or floors, with or without fans. This would be the best option if you want to heat only a few rooms. An open floor plan is another way to achieve good heat distribution with few walls to block air movement. If you are planning wood heating as part of a new home or major renovation, consider an open floor plan.

Operation and Maintenance

This section describes routine maintenance that every wood-burning unit needs. Always read your owner's manual and follow the instructions carefully.

Routine Maintenance

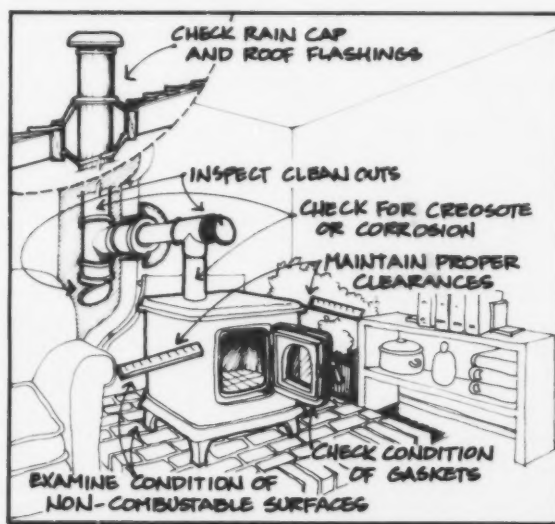


Figure 16 Points for routine maintenance

Before each heating season, check the unit thoroughly. Figure 16 identifies points for routine maintenance of a stove. Check the condition of the dampers and hinges, any insulating liners, gaskets around the doors of airtight stoves, and the stovepipe. Replace any parts that show wear or corrosion. Make sure the unit, stovepipe and chimney are creosote free.

If you have a catalytic combustor, make sure it is not clogged. Clean the entry and exit surfaces with a soft brush. Do not scrape the combustor or clean inside the mesh.

Measure clearances to make sure that items such as furniture and stacked wood are still at a safe distance.

Chimney Maintenance

The main task in chimney maintenance is to remove creosote. If creosote builds up too much, it can catch fire. A chimney fire can damage your chimney or burn down your house.

Creosote can also corrode the chimney and your appliance.

Creosote is formed by the condensation of gases and the depositing of particles from the smoke of wood or coal fires. The cooler the chimney, the more gases will condense and more creosote will result. More creosote is also produced by low-output, smoky fires.

How often your system needs to be cleaned depends on the unit and how you use it. The only way to know is to visually inspect the chimney and the stovepipe. When you install an appliance, inspect it frequently -- every week or two --until you have determined the rate of creosote formation. Install clean-outs to allow easy inspection of your stovepipe and chimney.

If you have creosote deposits a quarter-inch thick, it's time to clean. Hire professional chimney sweeps or do the job yourself. If you do it yourself, you should use the same equipment as the professionals. You will need a nylon bristle brush that fits snugly inside the chimney, lengths of handle to attach to the brush, and a smaller brush to clean the corners of the connectors.

If you are cleaning the chimney from above, be sure to close off the unit below to keep soot from spreading into the house as you brush them down. If cleaning from below, you will need a shop type vacuum to keep the dust from spreading.

You can reduce creosote, but you cannot eliminate it. The more completely you burn wood and smoke, the less creosote you will have. Some units have features such as catalytic combustors and insulating stove liners that increase the combustion efficiency. Use also affects creosote build-up. Brisk fires will deposit less creosote than low-burning fires. Chimney characteristics are important too. The chimney should be of proper size and installed on an interior wall, if possible, to keep exhaust gases hot. Chimneys on exterior walls should be well insulated from the outside.

What To Do If You Have a Chimney Fire

Wood and coal burning appliances have a greater chance of chimney fires than other appliances. You should have a chemical fire extinguisher near the appliance. If you have a fire, spray the extinguisher into the unit and shut off the air supply to the appliance. Call the fire department and evacuate the house.

Wood Preparation

Use dry wood. Wood with a high moisture content, such as freshly cut green wood, burns less efficiently.

The best way to dry wood is to:

- Split it. The smaller the pieces, the more quickly they will dry.

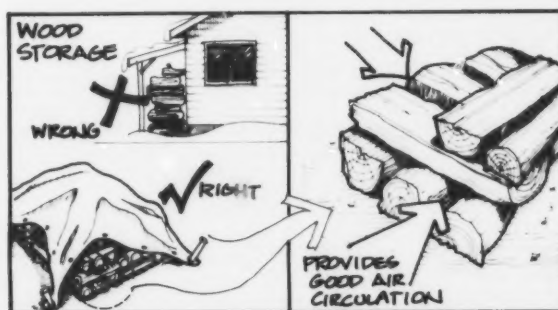


Figure 17 Guidelines for wood stacks

- Stack it. Stack the wood in layers of alternating directions to allow good air movement. This will speed drying (Figure 17).
- Store it. Keep the wood pile dry with tarpaulins or a make-shift roof for at least six months. Do not store wood inside to dry. It produces a lot of moisture and may cause excess humidity in your house.

Table 2 lists the energy content per dry cord of woods native to Alberta. The amount you need depends on the output of your stove and the energy content of the wood. The higher the energy content, the less you need.

Table 2

Energy Content of Woods Native to Alberta

Species	Energy Content per Cord	
White Birch	25	GJ (23.6 million BTU)
Tamarack (Larch)	23	GJ (22 million BTU)
Douglas Fir	21	GJ (20 million BTU)
Pine (Lodgepole, Jack)	19	GJ (18 million BTU)
Aspen (White Poplar)	18.4	GJ (17.4 million BTU)
Alder	18.1	GJ (17.2 million BTU)
Spruce (Black, White)	18	GJ (17.1 million BTU)
Willow	17.9	GJ (17 million BTU)
Balsam Fir	16	GJ (15.3 million BTU)
Balsam Poplar (Black Poplar)	15.8	GJ (15.1 million BTU)

Tips for Safe Wood Burning

- Cut the wood the right length for your firebox.
- Don't over-fire your stove. It can get dangerously hot and crack or warp.
- Control the burn by adjusting the air inlets to achieve a longer, sustained burn. Remember that this type of fire produces more smoke and creosote. Stoking the fire up to a brisk burn for 10 to 20 minutes after each slow burn will help reduce creosote build-up.
- Do not burn treated wood. It gives off toxic gases. Do not burn large quantities of paper or boughs. These burn quickly and give off an intense heat that could start a chimney fire. Do not burn artificial logs in a stove or burn more than one at a time in a fireplace. They often contain paraffin which burns very hot.
- Keep a fire extinguisher handy.
- Keep your smoke detector in good repair and ensure it is in a good location.
- Do not dispose of ashes until they are cold. Clean ashes into a metal pail.
- Never use fire-starter, gasoline, kerosene or other similar fuels.
- Inspect the chimney frequently for creosote and clean it regularly.

Summary

Before shopping for fireplaces or stoves, decide:

- whether you want an appliance for pleasure or heating
- whether you are ready for the routine chores of maintaining a fireplace or stove
- whether you have a ready source of fuel
- whether you want to burn wood, coal or both
- the type of appliance you want and the features you need.

Look for approved appliances, and be sure your choice is installed properly and maintained regularly.

If you follow these steps, your fireplace or stove should meet your expectations of cost, convenience and efficiency, also it will operate safely and reliably for many years.

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Dial 0 and ask for ZENITH 22339
(Edmonton 427-5300)

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